

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1-2. (Canceled)

~~3.~~ (Previously Presented) A carrier head, comprising:

a housing to be secured to a drive shaft;

a base assembly;

a loading chamber controlling the position of the base assembly relative to the housing;

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface and a plurality of concentric annular flaps secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers; and

a retaining ring joined to the base assembly;

wherein the carrier head includes five pressurizable chambers.

4. (Canceled)

~~5.~~ (Currently Amended) A carrier head, comprising:

a housing to be secured to a drive shaft;

a base assembly;

a loading chamber controlling the position of the base assembly relative to the housing;

and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface and a plurality of concentric flexible annular flaps secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers;

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wherein at least one of the annular flaps includes a notch positioned and configured to reduce ~~compressions in the main portion caused by~~ downward load transmitted from at least one of the chambers through the annular flap of the flexible membrane to the main portion so as to reduce compressions in the main portion.

~~3~~ 6. (Original) The carrier head of claim ~~5~~, wherein the notch is formed at a juncture between the at least one annular flap and the main portion.

~~4~~ 7. (Previously Presented) A carrier head, comprising:
a housing to be secured to a drive shaft;
a base assembly;
a loading chamber controlling the position of the base assembly relative to the housing;
and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface and a plurality of concentric annular flaps secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers;

wherein at least one of the annular flaps includes a widened section adjacent a juncture between the at least one annular flap and the main portion.

~~5~~ 8. (Original) The carrier head of claim ~~7~~, wherein the at least one annular flap includes a horizontal portion extending from the base assembly to the widened section.

~~9~~ 9. (Canceled)
~~10-12~~ 10-12. (Withdrawn)

~~13~~ 13. (Currently Amended) A carrier head, comprising:
a base assembly; and

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a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface and a plurality of concentric annular portions extending from the main portion and secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers, at least one of the annular portions including a notch positioned and configured to reduce ~~compressions in the main portion caused by~~ downward load transmitted from at least one of the chambers through the annular portion of the flexible membrane to the main portion so as to reduce compressions in the main portion.

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~~14.~~ (Original) The carrier head of claim ⁶~~13~~, wherein the notch is formed at a juncture between the at least one annular portion and the main portion.

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~~15.~~ (Previously Presented) A carrier head, comprising:
a base assembly; and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface and a plurality of concentric annular portions extending from the main portion and secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers, at least one of the annular portions including a notch;

wherein a first notch of the plurality of notches is formed at a juncture between the at least one annular portion and the main portion and a second notch of the plurality of notches is formed at about a mid-point of the annular portion.

⁹
~~16.~~ (Original) The carrier head of claim ⁸~~15~~, wherein a first notch of the plurality of notches is formed at a juncture between the at least one annular portion and the main portion and a second notch of the plurality of notches is formed at about a mid-point of the annular portion.

¹⁰
~~17.~~ (Original) A carrier head, comprising:
a base assembly; and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface, an outer annular portion extending from an edge of the main portion and secured to the base assembly, and an inner annular portion extending from the main portion and secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers, the inner annular portion including a notch.

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~~18.~~ (Original) A carrier head, comprising:
a base assembly; and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface, an outer annular portion extending from an edge of the main portion and secured to the base assembly, and an inner annular portion extending from the main portion and secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers, the inner annular portion including a widened section adjacent a juncture between the inner annular portion and the main portion.

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~~19.~~ (Original) The carrier head of claim ~~18~~, wherein the inner annular portion includes a horizontal portion extending from the base assembly to the widened section.

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~~20.~~ (Original) The carrier head of claim ~~18~~, wherein the inner annular portion includes a rim section between the base assembly and the widened section.

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~~21.~~ (Original) The carrier head of claim ~~20~~, wherein the widened section includes a sloped face on a side closer to the rim, and a generally vertical face on a side opposite the rim.

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~~22.~~ (Original) The carrier head of claim ~~21~~, wherein the rim section is connected to a top vertex of the widened section.

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~~23.~~ (Original) A carrier head, comprising:

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a base assembly; and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface, an outer annular portion extending from an edge of the main portion, a first flap connected to a top vertex of the outer annular portion and secured to the base assembly, and a second flap connected to a second vertex of the outer annular portion and secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers.

¹⁷
~~24.~~ (Original) A flexible membrane for use in a chemical mechanical polishing carrier head, comprising:

a generally circular main portion with a lower surface to provide a substrate-mounting surface;

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an outer annular portion extending from an edge of the main portion to be secured to a base assembly of the carrier head; and

an inner annular portion extending from the main portion to be secured to the base assembly, the inner annular portion including a notch.

¹⁸
~~25.~~ (Original) A flexible membrane for use in a chemical mechanical polishing carrier head, comprising:

a generally circular main portion with a lower surface to provide a substrate-mounting surface;

an outer annular portion extending from an edge of the main portion to be secured to a base assembly of the carrier head; and

an inner annular portion extending from the main portion and secured to the base assembly, the inner annular portion including a widened section adjacent a juncture between the inner annular portion and the main portion.

¹⁹
~~26.~~ (Previously Presented) A carrier head, comprising:

a housing to be secured to a drive shaft;

a base assembly;

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a loading chamber controlling the position of the base assembly relative to the housing;
and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface and a plurality of flexible concentric annular flaps secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers;

wherein at least one of the annular flaps includes a notch adapted to allow the at least one of the annular flaps to flex when the pressure is unequal in adjacent pressurizeable chambers.

²⁰
~~27.~~ (Previously Presented) The carrier head of claim ¹⁹~~26~~, wherein the notch is formed at a juncture between the at least one annular flap and the main portion.

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~~28.~~ (Previously Presented) A carrier head, comprising:
a base assembly; and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface and a plurality of concentric annular portions extending from the main portion and secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers, at least one of the annular portions including a notch adapted to allow the at least one of the annular portions to flex when the pressure is unequal in adjacent pressurizeable chambers.

²²
~~29.~~ (Previously Presented) The carrier head of claim ²¹~~28~~, wherein the notch is formed at a juncture between the at least one annular portion and the main portion.

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~~30.~~ (Previously Presented) A carrier head, comprising:
a base assembly; and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface, an outer annular portion extending from an edge of the main portion and secured to the base assembly, and an inner annular portion extending from the main portion and secured to the base assembly, the volume between the base assembly and the

flexible membrane forming a plurality of pressurizable chambers, the inner annular portion including a notch adapted to allow the inner annular portion to flex when the pressure is unequal in adjacent pressurizeable chambers.

~~24~~
~~31.~~ (Previously Presented) A flexible membrane for use in a chemical mechanical polishing carrier head, comprising:

a generally circular main portion with a lower surface to provide a substrate-mounting surface;

an outer annular portion extending from an edge of the main portion to be secured to a base assembly of the carrier head; and

an inner annular portion extending from the main portion to be secured to the base assembly, the inner annular portion including a notch adapted to allow the inner annular portion to flex.

~~25~~
~~32.~~ (Previously Presented) A carrier head, comprising:

a base assembly; and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface, an outer annular portion extending from an edge of the main portion and secured to the base assembly, and an inner annular portion extending from the main portion and secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers, the inner annular portion including a widened section adjacent a juncture between the inner annular portion and the main portion and a section extending generally parallel to the main portion that has a first edge joined to an apex of the widened section and a second edge secured to the base assembly.

~~26~~
~~33.~~ (Previously Presented) A carrier head, comprising:

a housing to be secured to a drive shaft;

a base assembly;

a loading chamber controlling the position of the base assembly relative to the housing;

and

a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface and a plurality of concentric annular flaps secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers;

wherein at least one of the annular flaps includes a widened section adjacent a juncture between the at least one annular flap and the main portion,

and wherein the widened section stiffens the annular flap allowing it to resist bowing when there is unequal pressure in adjacent pressurizable chambers.

²⁷
~~24.~~ (Previously Presented) The carrier head of claim ²⁶~~25~~, wherein the at least one annular flap includes a horizontal portion extending from the base assembly to the widened section.

²⁸
~~25.~~ (Previously Presented) A carrier head, comprising:
a base assembly; and
a flexible membrane having a generally circular main portion with a lower surface that provides a substrate-mounting surface, an outer annular portion extending from an edge of the main portion and secured to the base assembly, and an inner annular portion extending from the main portion and secured to the base assembly, the volume between the base assembly and the flexible membrane forming a plurality of pressurizable chambers, the inner annular portion including a widened section adjacent a juncture between the inner annular portion and the main portion,

wherein the widened section stiffens the inner annular portion allowing it to resist bowing when there is unequal pressure in adjacent pressurizable chambers.

²⁹
~~26.~~ (Previously Presented) The carrier head of claim ²⁸~~25~~, wherein the inner annular portion includes a horizontal portion extending from the base assembly to the widened section.

³⁰
~~27.~~ (Previously Presented) The carrier head of claim ²⁸~~25~~, wherein the inner annular portion includes a rim section between the base assembly and the widened section.

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~~38~~ (Previously Presented) The carrier head of claim ~~37~~³⁰, wherein the widened section includes a sloped face on a side closer to the rim, and a generally vertical face on a side opposite the rim.

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~~39~~ (Previously Presented) The carrier head of claim ~~38~~³¹, wherein the rim section is connected to a top vertex of the widened section.

~~33~~
~~40~~ (Previously Presented) A flexible membrane for use in a chemical mechanical polishing carrier head, comprising:

a generally circular main portion with a lower surface to provide a substrate-mounting surface;

an outer annular portion extending from an edge of the main portion to be secured to a base assembly of the carrier head; and

an inner annular portion extending from the main portion and secured to the base assembly, the inner annular portion including a widened section adjacent a juncture between the inner annular portion and the main portion,

wherein the widened section stiffens the inner annular portion.
